National Transportation Safety Board
Aviation Incident Final Report

Location:	SAVANNAH, GA	**Incident Number:**	ATL93IA113
Date & Time:	06/18/1993, 1346 EDT	**Registration:**	N467AA
Aircraft:	MCDONNELL DOUGLAS DC-9-82	**Aircraft Damage:**	Minor
Defining Event:		**Injuries:**	133 None
Flight Conducted Under:	Part 121: Air Carrier - Scheduled		

Analysis

APPROXIMATELY ONE MINUTE AFTER TAKEOFF, THE CREW OBSERVED LEFT ENGINE FIRE WARNING INDICATIONS IN THE COCKPIT. THE LEFT ENGINE POWER LEVER WAS RETARDED, AND A TURN TOWARDS THE AIRPORT WAS INITIATED. THE FIRE WARNING INDICATIONS ACTUATED INTERMITTENTLY UNTIL THE CREW SHUT DOWN THE ENGINE AND ACTIVATED THE ENGINE FIRE EXTINGUISHER. AN UNEVENTFUL LANDING WAS PERFORMED. GROUND PERSONNEL INFORMED THE CAPTAIN OF VISIBLE FIRE DAMAGE TO THE LEFT ENGINE, AND AN EMERGENCY EVACUATION WAS PERFORMED. AN INSPECTION OF THE LEFT ENGINE REVEALED A LEAK AT THE NO. 7 FUEL NOZZLE, WHICH WAS THE ORIGIN OF THE FIRE. A HOLE WAS BURNED IN THE DIFFUSER CASE, WHICH ALLOWED HOT GASES TO ESCAPE AND CONTACT OIL LINES. THIS RESULTED IN EXTENSIVE FIRE DAMAGE TO THE ENGINE AND COWLING.

Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this incident to be: LEAKAGE OF THE NUMBER 7 FUEL NOZZLE, WHICH RESULTED IN AN IN FLIGHT ENGINE FIRE.

Findings

Occurrence #1: FIRE
Phase of Operation: TAKEOFF - INITIAL CLIMB

Findings
1. (C) FUEL SYSTEM,NOZZLE - LEAK

Factual Information

On June 18, 1993, at about 1346 eastern daylight time, a McDonnell Douglas DC-9-82(MD-82), N467AA, returned to the Savannah Municipal Airport, Savannah, Georgia, following an in flight engine fire. There were no injuries to the airline transport captain, first officer, four flight attendants, and 127 passengers. The aircraft had minor damage. Flight 383 was conducted under 14 CFR Part 121 by American Airlines, Inc. Visual meteorological conditions prevailed at the time, and an instrument flight rules flight plan was in effect for the scheduled, domestic, passenger flight to Dallas/Fort Worth Airport, Texas. The flight departed Savannah at about 1345.

The captain reported the following: The before starting engines, after start, taxi, and takeoff phases were normal. Approximately one minute after takeoff, the left engine fire warning system activated. The aural fire warning indications were silenced by the first officer using the "fire bell off" button. The power was reduced on the left engine to idle, and the captain was about to read the checklist when a second fire warning activated. The aural warning was again silenced by the first officer. This sequence continued for a total of three or four times, with the first officer silencing the aural warning each time. The left engine fire handle was pulled, and a single extinguishing agent was actuated. The fire warning light extinguished about 2 seconds after the activation of the extinguishing agent. Neither the fire warning light, nor the aural warning activated again during the remainder of the flight. He recalled that after the activation of the fire warning system, a check of the engine instruments revealed nothing abnormal. He performed an uneventful landing on runway 9 at the Savannah Airport. After landing, the aircraft exited the runway, followed by three fire trucks. An initial assessment of the aircraft revealed no evidence of smoke or flames, and the flight crew initiated taxi to the gate. Subsequent communication with the fire trucks revealed that there was visible fire damage to the left engine. The captain stopped the aircraft, and ordered an emergency evacuation. All passengers exited the aircraft via the left and right front door exits. After the evacuation was complete, the aircraft was secured.

The digital flight data recorder (DFDR) from the incident aircraft was removed and sent to the National Transportation Safety Board laboratory in Washington, DC for readout and evaluation. The recovered data revealed that the aircraft was in a climbing left turn, and passing 2,000 feet pressure altitude, when the left engine fire warning discrete activated. The aircraft continued the climbing, left turn until a level off at 2,900 feet was performed. The aircraft then began a descent, and when passing through 2,800 feet (72 seconds after the first fire warning discrete activated) a second fire warning discrete activated. The left fire warning discrete then cycled on and off intermittently. While descending through 1,800 feet, and having just rolled to a wings level attitude, the left engine speeds and exhaust gas temperature (EGT) began decreasing rapidly in a manner consistent with an engine shutdown. This occurred 1 minute and 34 seconds after the initial fire warning activation. The aircraft touched down approximately 5 minutes and 45 seconds after takeoff.

An initial inspection of the aircraft after the incident revealed extensive fire damage to the left engine and nacelle. Several pieces of burned nacelle fragments were found on the landing runway and taxiway. There was no observed damage to the aircraft fuselage.

The left engine was removed from the aircraft and shipped to the American Airlines maintenance facility in Tulsa, Oklahoma for an examination. The examination revealed that

there was evidence of a fuel leak at the number 7 fuel nozzle. An examination of the number 7 fuel nozzle revealed the nozzle support mount flange, nozzle support heat shield, and nozzle head swirl vanes had partially melted. A leak and flow check confirmed leakage at the nozzle support-to-head interface. For a detailed description of the engine examination, refer to the Engine Teardown Factual Report, attached to this report.

Pilot Information

Certificate:	Airline Transport; Commercial	**Age:**	43, Male
Airplane Rating(s):	Multi-engine Land; Single-engine Land	**Seat Occupied:**	Left
Other Aircraft Rating(s):	None	**Restraint Used:**	Seatbelt, Shoulder harness
Instrument Rating(s):	Airplane	**Second Pilot Present:**	Yes
Instructor Rating(s):	Airplane Multi-engine; Airplane Single-engine	**Toxicology Performed:**	No
Medical Certification:	Class 1 Valid Medical--w/ waivers/lim.	**Last FAA Medical Exam:**	12/17/1992
Occupational Pilot:		**Last Flight Review or Equivalent:**	
Flight Time:	8500 hours (Total, all aircraft), 3840 hours (Total, this make and model), 200 hours (Last 90 days, all aircraft), 4 hours (Last 24 hours, all aircraft)		

Aircraft and Owner/Operator Information

Aircraft Make:	MCDONNELL DOUGLAS	**Registration:**	N467AA
Model/Series:	DC-9-82 DC-9-82	**Aircraft Category:**	Airplane
Year of Manufacture:		**Amateur Built:**	No
Airworthiness Certificate:	Transport	**Serial Number:**	49597
Landing Gear Type:	Retractable - Tricycle	**Seats:**	149
Date/Type of Last Inspection:	AAIP	**Certified Max Gross Wt.:**	150500 lbs
Time Since Last Inspection:		**Engines:**	2 Turbo Fan
Airframe Total Time:	13926 Hours	**Engine Manufacturer:**	P&W
ELT:		**Engine Model/Series:**	JT8-217-C
Registered Owner:	AMERICAN AIRLINES, INC.	**Rated Power:**	20000 lbs
Operator:	AMERICAN AIRLINES, INC.	**Operating Certificate(s) Held:**	Flag carrier (121)
Operator Does Business As:	AMERICAN AIRLINES	**Operator Designator Code:**	AALA

Meteorological Information and Flight Plan

Conditions at Accident Site:	Visual Conditions	**Condition of Light:**	Day
Observation Facility, Elevation:	SAV, 51 ft msl	**Distance from Accident Site:**	3 Nautical Miles
Observation Time:	1353 EDT	**Direction from Accident Site:**	250°
Lowest Cloud Condition:	Scattered / 5000 ft agl	**Visibility**	20 Miles
Lowest Ceiling:	None / 0 ft agl	**Visibility (RVR):**	0 ft
Wind Speed/Gusts:	11 knots /	**Turbulence Type Forecast/Actual:**	/
Wind Direction:	120°	**Turbulence Severity Forecast/Actual:**	/
Altimeter Setting:	30 inches Hg	**Temperature/Dew Point:**	31°C / 17°C
Precipitation and Obscuration:			
Departure Point:		**Type of Flight Plan Filed:**	IFR
Destination:	DALLAS/FT WORTH, TX (DFW)	**Type of Clearance:**	IFR
Departure Time:	1345 EDT	**Type of Airspace:**	Class E

Airport Information

Airport:	SAVANNAH MUNICIPAL (SAV)	**Runway Surface Type:**	Asphalt
Airport Elevation:	51 ft	**Runway Surface Condition:**	Dry
Runway Used:	9	**IFR Approach:**	Visual
Runway Length/Width:	9003 ft / 150 ft	**VFR Approach/Landing:**	None

Wreckage and Impact Information

Crew Injuries:	6 None	**Aircraft Damage:**	Minor
Passenger Injuries:	127 None	**Aircraft Fire:**	In-Flight
Ground Injuries:	N/A	**Aircraft Explosion:**	None
Total Injuries:	133 None	**Latitude, Longitude:**	

Administrative Information

Investigator In Charge (IIC):	RALPH E HICKS	**Report Date:**	08/01/1994
Additional Participating Persons:	JEROME FRECHETTE; WASHINGTON, DC CHARLES PEREIRA; WASHINGTON, DC ALBERT REITAN; WASHINGTON, DC DAVID IVEY; WASHINGTON, DC		
Publish Date:			
Investigation Docket:	NTSB accident and incident dockets serve as permanent archival information for the NTSB's investigations. Dockets released prior to June 1, 2009 are publicly available from the NTSB's Record Management Division at pubinq@ntsb.gov, or at 800-877-6799. Dockets released after this date are available at http://dms.ntsb.gov/pubdms/.		